REMARKS

Claims 1 and 4-13 are pending in the present application. In the Office Action dated May 9, 2003, the Examiner rejected claims 1, 4-7 and 10-12 under 35 U.S.C. § 102(a) as anticipated by U.S. Patent No. 5.769,699 to Yu ("Yu"). The Examiner also rejected claims 8 and 9 under 35 U.S.C. § 103(a) as unpatentable over the Yu reference in view of U.S. Patent No. 4,918,869 to Kitta ("Kitta"). Applicant respectfully requests reconsideration of the present application in view of the present amendments and following remarks.

In the remarks that follow, various technical differences between the references cited by the Examiner and the embodiments of the present invention are discussed. It is understood that the discussion involving various embodiments of the invention, which are disclosed in detail in the applicant's specification, do not define the scope or interpretation of any of the claims. Any discussion of differences between the references cited and the various embodiments of the invention are intended only to help the Examiner to appreciate the importance of the claimed distinctions as they are discussed.

The disclosed invention is directed towards methods and apparatuses for planarizing microelectronic substrates. In a pertinent embodiment of the disclosed invention, as shown in Figure 6 of the present application, a membrane 250 is positioned within a substrate holder 231 that retains a substrate 112 while the substrate is planarized. The membrane 250 includes a peripheral portion 251 that may have a thickness greater than the central portion 252. Alternatively, in still other embodiments, the peripheral portion 251 may have a thickness that is thinner than the central portion 252. In either case, the membrane 250 may be fabricated from a generally flexible, compressible solid material, as shown in Figure 6, which may be comprised of neoprene or a silicone rubber, although other resilient, flexible and compressible materials may be also be used to fabricate the membrane.

When the substrate 112 is undergoing planarization, the substrate holder 231 and the membrane 250 apply downward forces onto the substrate 112 to force the substrate 112 against a planarization pad (not shown in Figure 6). The relatively thicker portions of the membrane 250 correspondingly exert a greater force on portions of the substrate 112 that

contact the thicker portions of the membrane 250, while the relatively thinner portions of the membrane 250 exert a lesser force on other portions of the substrate 112. Consequently, the portions of the substrate 112 subjected to the greater normal force are planarized at a greater rate than the portions of the substrate 112 that are in facial contact with the thinner portions of the membrane 250. In particular, when the thicker portions of the membrane 250 are positioned in the peripheral portion 251 of the membrane 250, substrates 112 having features toward the periphery of the substrate 112 that require higher planarization rates are more effectively planarized since the additional normal force presented by the peripheral portion 251 allows the substrate periphery to be planarized at a greater rate than is achievable by the greater linear velocity at the periphery of the substrate 112 alone.

The Examiner has cited the Yu reference for disclosing a polishing pad that improves polishing uniformity by having regions on the pad that have different thicknesses. Referring now to Figure 4 of the Yu reference, a polishing pad 31 is positioned on a platen 14. Substrates 13 are retained by substrate holders 12 that force the substrates 13 onto a surface of the pad 31 as the pad 31 is rotated by the platen 14. The pad 31 includes a raised central region 32 having a first thickness, and having a peripheral region 33 having a second thickness. Accordingly, the pad 31 may apply different forces to the substrates 13 as they are planarized.

Yu does not disclose or fairly suggest biasing a substrate against a planarizing medium with a flexible membrane to exert a first force on a first part of the microelectronic substrate and exert a second force greater than the first force on a second part of the microelectronic substrate, where the substrate is held stationary relative to the membrane as the substrate is moved across the planarizing medium.

The Kitta reference has been cited by the Examiner for teaching a substrate carrier with a flexible membrane that is structured to receive and retain a substrate. With reference to Figure 5 in the Kitta reference, the flexible membrane includes a first member 11 having a first thickness that is positioned on a second member 1 having a second thickness. Wafers W are then positioned between member 1 and the planarization surface 2. The Kitta reference, however, does not teach or suggest a flexible member with a contoured surface that allows the application of normal forces of different magnitudes to be applied to the substrate while the substrate is

being planarized, as disclosed in the embodiments of the applicant's invention. Moreover, the Kitta reference emphasizes the importance of maintaining the proper air pressure within an air chamber (see element 12 in Figure 5 of Kitta) so that the members 1 and 11 do not exhibit the curvature of members 1 and 11 as shown in Figures 6a and 6b, thus preventing the occurrence of different normal forces acting on the substrate during planarization. This teaching is given at col. 4, lines 38-64 of the Kitta reference. The Kitta reference therefore teaches away from the disclosed invention in this central respect.

Turning now to the claims, distinguishing differences between the cited art and the claim language will be specifically pointed out. Claim 1, as amended, recites in pertinent part, "A carrier for supporting a microelectronic substrate relative to a planarizing medium during planarization of the microelectronic substrate, the carrier comprising...a support member...and...a flexible, compressible membrane adjacent to the support member, the membrane having a first portion with a first thickness and a second portion with a second thickness greater than the first thickness, the first portion of the membrane being aligned with a first part of the microelectronic substrate when the membrane engages the microelectronic substrate, the second portion of the membrane being aligned with a second part of the microelectronic substrate when the membrane engages the microelectronic substrate, *the substrate being held stationary with respect to the membrane as the substrate is moved relative to the planarizing medium.*" (Emphasis added). The Yu reference does not teach this. Instead, Yu teaches moving a substrate across a planarizing medium that has an irregular surface.

Claim 1 is therefore allowable over the Yu reference. Claims depending from claim 1 are also allowable based upon the allowability of the base claim and further in view of the additional limitations recited in the dependent claims.

With respect to Examiner's rejections under 35 U.S.C. § 103(a), applicant respectfully asserts that the foregoing amendment fully addresses this rejection

Claims 60-88 are new. No new matter as been added.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

DORSEY & WHITNEY LLP

Steven H. Arterberry
Registration No. 46,314

SHA:pep

Enclosures:
Postcard
Check
Fee Transmittal Sheet (+ copy)

1420 Fifth Avenue, Suite 3400
Seattle, WA 98101-4010
(206) 903-8800 (telephone)
(206) 903-8820 (fax)

h:\ip\documents\clients\micron technology\200\500200.02\500200.02 amendment.doc